laws for notification and isolation of disease; the status and education of medical officers of health and of sanitary inspectors.

In consequence of the wide scope covered by these subjects, it is proposed that the work of the Congress shall be divided between ten Sections. The order in which they will stand is not finally settled, but they may be briefly summarized as follows:—(1) Demography, which necessarily involves questions of industrial health; (2) communicable diseases; (3) bacteriology; (4) diseases of animals in relation to man; (5) hygiene of infancy and childhood; (6) engineering in relation to hygiene; (7) architecture in relation to hygiene; (8) chemistry in relation to hygiene; (9) military and naval hygiene; and last, but not least important, (10) the functions of the State in relation to hygiene.

The Prince of Wales, who has so deep a personal interest in all matters relating to the well-being of the community, at once acceded to the request made to him to accept the post of President of the Congress; and the British Presidents and other officers of Sections will be among the most eminent men in their several departments of knowledge. Upon them will lie the duty of organizing the work of the several Sections before the Congress meets. They will be supplemented at the meeting of the Congress by foreign or colonial and Indian representatives, distinguished in the several branches of science included in the programme. It may be mentioned that above 2000 members, exclusive of representatives from Great Britain, attended the Vienna Congress; and it is anticipated that the Congress in London will attract at least an equal number of persons from foreign countries, because Great Britain affords so many examples of important sanitary works, as well as of institutions having the preservation or restoration of health as their main object.

The expenses of correspondence and other matters connected with the organization of the Congress are so large that appeal is made to those interested in the subjects to be discussed to aid the work by moderate contributions.

GEOLOGICAL TEXT-BOOKS.

Class-Book of Geology. By Archibald Geikie, F.R.S. Second Edition. (London: Macmillan and Co., 1890.)

Elementary Geology. By Charles Bird, B.A., F.G.S. (London: Longmans, Green, and Co., 1890.)

ALL who care for geology, teachers and students especially, will hail with delight the appearance of a second edition of Dr. A. Geikie's "Class-book." All the more that it may now be had at less than one-half the cost of the first edition. Such a substantial reduction in the price of a scientific book is a piece of liberality and far-seeing policy which it could be wished were more common. Too often, when a rapid sale of such a work has proved that its value is appreciated and its success assured, there seems to be a feeling that its established reputation may be relied upon to ensure a demand for it in the future equal to that of the past, and that it will be quite safe to keep up its price. But no such purely mercantile views have prevailed here, and we may feel sure that both publishers and author have been actuated first of all, in the bold step they have taken, by a wish to promote the extension of knowledge by placing within the reach of as many as possible a work so well got up, so admirably illustrated, and so full of matter presented in an eminently readable form. And there can be little doubt that this disinterested conduct will reap the reward it deserves. Many a teacher will bear me out that the book has been a universal favourite. Students who would not put up with the dry compendium of the normal text-book have been won over by its attractive style; and even those earnest workers, who despise or excuse the absence of literary elegance, have found their labours lightened and have felt an added pleasure when their first introduction to geology has been through the medium of this class-book. One thing only prevented its being adopted far and wide as a text-book in the school and lecture-room. Now that obstacle is removed, it is sure to come into more and more extensive use; and it may be confidently predicted that a rapidly increasing sale will soon recoup those concerned for any temporary loss that their generous treatment of the public may at first occasion.

It is the conviction that it will not be long before a second opportunity for revision presents itself, and a wish to give, if it can be done, some help towards making so excellent a book more perfect still, that embolden me to be critical, and to point out a few minor points which seem capable of emendation; and I take this course with the less hesitation, and with no fear of being misunderstood, because I have endeavoured, in a previous notice of the first edition, to do justice to the many excellences of the work and to explain its scope.

I cannot say that the account of the formation of "flood plains," on p. 39, quite commends itself to my mind. The author postulates the existence of an alluvial flat, over which sand and silt are deposited during floods, but he does not explain how this flat is produced. Possibly the required explanation may be found in his "Physical Geography," which he recommends should be read in connection with the present work. If this be so, a reference to the passage required would be useful: indeed, wherever the one book is required for the elucidation of the other, it might be well to call attention to the fact in a note. The impartial and judicious blending of Darwin's and Murray's views on the growth of coral reefs is much to be commended. If we take into account the vast number of cases in which minerals occur without any external crystallized shape, it seems hardly safe to say that they have "in most cases a certain geometrical form" (p. 123). But the mineralogical sketch seems capable of improvement in more than one direction. The using "sides" and "faces" as if they were convertible terms, in the description of rock-crystal on p. 124, is apt to engender confusion of thought. In the account of felspars there is no mention of their cleavages, a property so often of practical value in distinguishing them from quartz, and a property far more easily recognized by the beginner than their monoclinic and triclinic crystallization. In some cases—mica, for instance—there is no mention of hardness, where that is a character useful in identification. It would not be fair to blame a geologist for the definition of the systems of crystallization given in the book before us, as long as it still survives in treatises on mineralogy. But it is much to be desired that the number and position of certain ideal axes should not be the starting-point for classification. If the grouping were based on the degree of symmetry possessed by each system, and it were afterwards, if necessary, pointed out that ideal axes had their uses, the point of real importance would have its due place, and things of subsidiary value would find their proper level. But, really, the amount of crystallography that there is room for in an elementary treatise on geology is so small, and it is so hopeless to attempt in this space to convey any idea of what crystallography means, that the subject in its general form had better be passed over altogether; it would be quite enough to explain what is meant by crystalline cleavage, and to call attention to the shape of crystals only in those cases, such as fluor spar and calcite, where they are common and easy to recognize. Many a student, who would simply be driven wild by an attempt at a systematic teaching of crystallography, has an eye good enough to enable him to recognize dog-tooth spar when he sees it, and to form a very fair idea whether an hexagonal pyramid is dumpy enough to belong to quartz. In teaching, it is quite enough, as a rule, to let the small amount of crystallography that a geologist must know drop in incidentally as occasion requires, taking special care that each fact is illustrated by a concrete example, so that the knowledge required may come in instalments and be assimilated bit by bit.

To continue in the censorious mood. The statement that "perlitic structure is one of the accompaniments of devitrification" (p. 145) is fraught with danger. Many readers, I fear, would take the words to imply that the structure is a result of devitrification, which of course is not their meaning. Why not say, "is often found in devitrified rocks, and is useful as indicating that they were once glassy"? I take decided objection to the statement, on p. 150, that grains of sand are usually rounded; as a rule, the sand-grains of a sub-aqueous sandstone are most markedly chips, and it is only when they have been exposed to æolian wear that they become even approximately rounded. The author is wisely guarded when he treats of the origin of flint; but the doctrine of the replacement of calcium carbonate by silica has so much in its favour, that it might, without much risk and with manifest advantage, have been mentioned. That quartzite is "an indurated siliceous sand" we shall all admit: it might have been usefully added that in many cases the induration has been caused by the deposition of secondary silica between its grains. In discussing the methods by which sedimentary deposits are consolidated, no mention is made of the tangential pressure exerted during great earth movements; surely this is one of the most, if not the most efficient agent in the work.

The stratigraphical part of the book is necessarily brief, but it is all to the point, and the reader ought to carry away from it clear notions as to the main features in the life and physical geography of each geological period. It is here that the distinctive excellence of the work, which places it so far above the level of the average dismal text-book, comes out most strongly. In the place of comparative tables of strata and lists of characteristic fossils, which an examinee commits to memory and forgets, we have graphic pictures of what England, and Europe in many cases, were like, and an account of what went on during geological periods—history, in fact, and written as an historian, and not as a compiler, writes. The illustrations are excellent: the author's well-known artistic skill adds a charm to the usefulness of many; and the figures of minerals, rock structures, and fossils are such faithful pictures, that, where a teacher is quite unable to procure specimens, they will to a large extent supply the want. The book closes with an appendix giving the classification of the vegetable and animal kingdoms, in which those points which are of special importance in palæontology have been judiciously picked out and made prominent.

In the preface to Mr. Bird's "Elementary Geology," we are told that "the following lessons were given to a class of thirty boys, and were very successful in arousing an interest in geology and in sending a number of town boys on long walks into the country;" and that they had also the comparatively unimportant result of enabling the class "to pass the South Kensington examination in the elementary stage of the subject." I have the best possible reason for feeling sure that the class-teaching of the author would deserve and secure the good results which he tells us followed from it. But I have grave doubts whether a beginner, who had the book alone to rely upon, would be won over to feel any great love for its subject. This, however, is no fault of the author's. As long as the main end of study is to enable the student to pass examinations, books must be written whose chief object is to help him to this end; they must be cheap, and therefore small; so they must be thickly packed. The second chapter of the work before us is an instance of how this must be done. It consists really of a definition of nearly all the terms which are to be used in the course of the work, and the reader who commits it carefully to memory will be armed with answers to a large number of the questions that may be put to him in examinations. But I am perfectly certain that Mr. Bird never gave a lesson in class, or a series of class-lessons, which is fairly represented by this chapter. No human being could survive the tedium which must be the result of thrusting upon him at one fell swoop such a crowd of new words and new conceptions. The success which crowned Mr. Bird's labours is in itself a proof that he never taught in this fashion; enthusiasm such as he kindled is not evoked by overwhelming the learner with a flood of dry statements at the outset of his career. That is just the way to create a distaste for a subject which no amount of subsequent amplification suffices to remove. Definitions we must have, but one who can teach like Mr. Bird knows how to bring them in one by one, at intervals, as they are wanted. Why his book is so unlike what must have been the style of his teaching has been explained already, and it is only giving him his due to confess that, considering how he has been trammelled, he has executed his task well, and that the book is above the average level of its class. He will, I am sure, allow me to point out, in no unkindly spirit, portions which seem capable of improvement.

There is the same crowding in chapters iii. and iv. as in chapter ii. The descriptions of the minerals in chapter iii. might enable a reader to answer some questions often set in examinations, but in many cases they would do little towards helping a student to know the mineral when he saw it, and this after all is what the real student wants. To learn how to worry out for himself that a mineral is probably a felspar is infinitely more valuable as a bit of educational discipline than to be able to write down in an examination the chemical composition of felspars. If only a few of the commoner rock-forming minerals had been treated of, it would have been quite possible in the space available to have given descriptions of the way in which a student must go to work in order to recognize them; but then some minerals must have been omitted that are liable to be "set" in examinations.

There are in the book many little slips, not very serious, which might usefully be corrected when opportunity offers. On p. 28 it should be stated that clay is hydrated. There is hardly reason to say that quartzite has been "almost melted" (p. 42); it is certain that in many cases its hardness is due to the deposition of secondary silica. It would have been as well to give some account of the physical characters of serpentine (p. 43), and greater definiteness of statement as to the minerals by the alteration of which it has been produced. I really hardly know what grounds there are for the statement, on p. 78, that the action of glaciers has had any thing to do with the production of immense perpendicular cliffs of limestone. One would have liked to see a section somewhat nearer the actual thing in the place of our old time-honoured friend the section across the Jura on p. 98. I am not sure, but I fear, that the dissolution of actual chalk in carbonated water would go on slowly (p. 45); freshly precipitated calcium carbonate dissolves fast enough, and is safer for lecture-room experiment. It is not carbonate of iron that gives a bluish-grey tint to rocks, as stated on p. 47. In chapters vii. to xi. it would seem that we have a much closer representation of the author's actual teaching than in the earlier part of the book; there is much life and brightness about them; and, while they are full of matter, it is presented in an attractive form. It would have been well to give distinctly the two main points of difference between Conchifers and Brachiopods on p. 113. The only character mentioned is that the latter are equilateral. The Trilobite on Fig. 110 is not a Paradoxides. The section on Fig. 139 is misleading; the Permian scarp nowhere towers above the Penine ridge in the way represented. It would certainly be desirable to add a word about the Alpine Trias on p. 169. The position of the siphuncle in Goniatites is incorrectly stated on p. 181. By a curious slip the Portland Beds get the credit of Mammalian remains on p. 193. In the figure of Inoceramus, on p. 213, the cartilage-pits of the hinge are described as teeth. In the notice of the Forest Bed, on p. 226, room might be found for a word about the Arctic Freshwater Bed.

After all this fault-finding, it is a pleasure to be able to call attention to the excellent character of the illustrations: they are numerous, well chosen, and admirably executed; the figures of fossils deserve special praise. The geological map of the British Isles will be most useful. It is not crowded, and the clear transparency of the colours is such as till lately was unknown in English chromolithography. The book belongs to a class that I have no great love for, but it is distinctly good of its kind; and it will prove useful in the hands of a teacher who knows how to dilute and season the condensed food which it offers, and whose aim, like the author's, is not merely to get his students through an examination, but to educate them and imbue them with the scholar's disinterested love for learning.

A. H. GREEN.

ELECTRO-METALLURGY.

The Art of Electrolytic Separation of Metals, &c. (Theoretical and Practical). By G. Gore, LL.D., F.R.S. *Electrician* Series. (London: The *Electrician* Publishing Co., 1890.)

A Treatise on Electro-Metallurgy. By W. G. McMillan, F.I.C., F.C.S. Griffin's Scientific Text-books. (London: Charles Griffin and Co., 1890.)

ANY metallurgical process which reduces the cost of production as compared with older processes for effecting similar results must of necessity prove of great commercial importance. This is especially the case in places where labour is dear and unskilled, and fuel and refractory materials both scarce and costly—perhaps, even, absolutely unobtainable. If, too, the new process enables a metal to be produced, as in the case of copper, which possesses superior quality to the metal produced by the older process, such a metal will command a higher market price, and the use of the new process is consequently attended with important commercial advantages.

Such an improvement over ordinary metallurgical processes has been effected in recent years by the gradual introduction of electrolytic methods. They have not, however, made the rapid progress which was at one time anticipated, and at present are practically only of importance in the metallurgy of copper. There are many reasons for this. The tendency to-day is to endeavour to increase to its maximum the daily output of existing works, provided the product already attainable is of fair quality, rather than to lay down new plant, which, although it might produce a metal of greater purity, would be severely handicapped by the slowness of the work and smallness of the output as a return for the capital invested. It is in this respect that electrolytic methods for the preparation of the ordinary commercial metals fail to give satisfactory results. It is true that in the cases of gold and silver this objection does not to so large an extent apply, but, unfortunately, other circumstances have also to be considered. The metallurgy of the precious metals is for the most part effected in the immediate neighbourhood of the mines, and these, in turn, are usually situated in out-of-the-way districts. Miners, too, and mill-men are generally but slightly acquainted with a knowledge of matters pertaining to electrolytic methods, and comparatively little attention has therefore been directed in the past to the treatment of the ores of the precious metals by such methods. There can, however, be but little doubt that in the near future this will cease to be the case, and that by the improvement of known methods, and by devising new ones, electrolytic methods will attain a degree of commercial importance which at present can hardly be foreshadowed. Any sound contribution to the literature of the subject which is likely to assist in this development